THE PREDICTION OF SUCCESS IN THE COLLEGE OF PHARMACY AT THE UNIVERSITY OF UTAH

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CHAPTER I

INTRODUCTION

THE PROBLEM

The purpose of this study is to assist with the guidance of students interested in entering the College of Pharmacy at the University of Utah. "The first obligation of the college is to evaluate, on the basis of test scores and other data, the student's personal abilities and interests, and to use this evaluation in predicting his performance in the future."[1]

"It would appear that data are needed, not only for the prognosis of general academic aptitude but also for determining an individual's chances for success in a given academic field even though he lacks aptitude for some other academic pursuit."[2] This approach is based upon the assumptions that "certain subjects of study differ from others in nature of the mental processes which they require; [and] that a substantial proportion of individuals differ within themselves in their relative command of these mental processes."[3] This study represents an

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1 Robert A. Davis, "Testing for Aptitudes," Journal of Educational Psychology, 36:45, 1945.

2 William McGehee, "The Prediction of Differential Achievement in a Technological College," Journal of Applied Psychology, 27:88, February, 1943.

3 Albert B. Crawford and Paul S. Burnham, Forecasting College Achievement, Part I (New Haven: Yale University Press, 1946), p. 5.

attempt to discover some means by which to measure the abilities required for success in the College of Pharmacy.

IMPORTANCE OF THE STUDY

Since more students are interested in taking college work than the number for which the proper facilities have been made available at this time, and since some students enrolled at the University of Utah are not able to fulfill the requirements for continuation and graduation in the particular college in which they are enrolled, it is necessary to have some standard by which to select those most likely to succeed in a particular curriculum. When a number of students drop out of the University each quarter because they do not have high enough grades to make further study practical, a waste is incurred by the students and by the University.

For effective guidance we need to determine the level of accomplishment which can be attained by an individual and the field, at any level, for which he is best suited. "As long as aims and standards of various colleges and even curriculums within colleges differ so widely, it is impossible to determine a general admissions criteria. Each institution must do its own research to ascertain its admissions standards."[4] Colleges

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4 Francis F. Bradshaw, "Colleges and Universities, VIII--Student Personnel Work, Admissions," Encyclopedia of Educational Research (New York: The Macmillan Co., 1941), p. 253.

within the University differ in difficulty apart from aptitudes. That is, a grade-point-ratio in one field is not equivalent to a grade-point-ratio in another. The guidance given a student will depend not only upon the educational philosophy of the institution but on the aptitudes and achievements of the students.

Studies similar to this one have been made for other colleges in the University, and on the basis of the objective data derived from this research regarding the students enrolled in the various colleges, it will be possible to present to students interested in selecting a major field of endeavor meaningful information as to their chances of success.

OUTLINE OF THE STUDY

An attempt was made to determine the efficiency with which success in the College of Pharmacy at the University of Utah could be determined for guidance purposes. The grade-point-ratio in pharmacy subjects is used as the criterion of success in the College of Pharmacy. Data for two studies were assembled for this purpose.

The sample for Study I is a group of sophomore students who were taking the standard pharmacy course for the third quarter of the sophomore year, spring quarter, 1948. The General Aptitude Test Battery, the Iowa Chemistry Aptitude Test, the Cooperative English Test, and the Cooperative General Achievement Tests in Social Studies, Natural Sciences, and

Mathematics were analyzed.

A second study was made because the zero order correlation coefficients between the G.A.T.B. and the grade-point-ratio in pharmacy subjects are lower than those between the other tests and the criterion. Since only a small number of students had scores both on the G.A.T.B. and the other tests, a larger sample was selected by which to check the validity of the predictive efficiency of the Chemistry Aptitude Test and the Cooperative Achievement Tests.

The sample for Study II includes all students, freshmen and sophomores alike, who had completed a full quarter's work of pharmacy subjects and who have scores on the following tests: The Chemistry Aptitude Test, the Cooperative English Test, and the Cooperative Achievement Tests in Social Studies, Natural Sciences, and Mathematics. Zero order correlation coefficients between these tests and the criterion were determined. The largest possible shrunken multiple correlation coefficient between the criterion and the test battery was then computed, and tables were set up by which the test scores could be converted into the most probable grade-point-ratio.

CHAPTER II

REVIEW OF RELATED STUDIES

Many studies on the prediction of academic success have been reviewed in the literature. The investigations have covered almost all aspects of the problem, sometimes resulting in conflicting reports. A review has been made below of some of the studies which have reported in a clear fashion the results which are generally obtained and which one might expect to obtain on future analyses, and studies which have approached the problem of prognosis in a unique fashion which seems to be of promise from the standpoint of guidance. The problems of the selection of a criterion of success in college, and the selection and use of various indices for the prediction of this success have been considered.

THE ESTABLISHMENT OF A CRITERION

The grade-point-ratio is generally accepted as the best criterion of success in college, as graduation and credits are determined on the basis of grades. "Nevertheless, in the interpretation of the correlations of test scores with marks, the unreliability of the criterion should be kept constantly in mind."[1]

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1 Arthur E. Traxler, "Comments on 'The Prediction of Differential Achievement in a Technological College.'" Journal of Applied Psychology, 27:177, September, 1943.

A grade is largely a subjective evaluation of a student's merit. Grades determined by different instructors cannot be compared exactly. In addition to this source of error, however, there is no mutual understanding of the significance of a grade, and the tests, upon which grades are based in part, are not carefully constructed.

In 1932 the admissions board of the University of Minnesota began the policy of sending the low aptitude students, on the basis of the Minnesota College Aptitude Test, to a separate college. It was discovered that the instructors in the advanced colleges made no adjustment to the more homogenous group. They continued to cling to the normal curve, and just as many students failed from the select group as had been failing before. Needless to say, the grades reported for students the year before this change in policy did not have the same significance as the grades reported for the following year.[2]

Queen's University in Belfast has adopted the policy of using examination scores rather than grades. A study reported by Idholm and Gibson did not show a higher correlation between these examination scores and scores on the predictive test than correlations reported between grades and predictive test scores.

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2 E.G. Williamson, "The Decreasing Accuracy of Scholastic Pre ictions," Journal of Educational Psychology, 29:13, 1937.

Raven's Progressive Matrices was correlated with anatomy and physiology marks with validity coefficients of .31 and .33 respectively. Although it is not possible to determine the comparable efficiency of the two criteria on the basis of this study, there is no evidence that an objective examination score is more or less valid than the customary grade-point-ratio.[3]

Francis Smith expressed the view that the grade-point-ratio does not give an accurate picture of a student's accomplishment because it does not distinguish between the "A" student taking eighteen hours and the "A" student taking twelve hours. He advocates the use of the number of grade points earned during the semester. This is probably a more accurate measure if the study includes only students who have had the same number of semesters at the university.[4]

Another possible criterion is academic survival. Frank S. Freeman stated that "all students who are able, or very nearly all, do apply sufficient energy to permit them to continue as students. And so long as a student meets at least the minimum requirements of his college, he is persona grata."[5] The prin-

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3 O.G. Edholm and Q.H. Gibson, "Examination Results and an Intelligence Test," Lancet, 2:294-297, August 26, 1944.

4 Francis F. Smith, "The Use of Previous Record in Estimating College Success," Journal of Educational Psychology, 36:167-176, 1945.

5 Frank S. Freeman, "Predicting Academic Survival," Journal of Educational Research, 23:114, 1931.

ciple disadvantage of the use of academic survival as the criterion of success in college is that it provides little information for guidance purposes. The probability of the student's dropping college for scholastic reasons (and this is the largest single factor explaining the high mortality among the freshman and sophomore years[6]) can be determined by the grade-point-ratio as well as by academic survival records. There is no opportunity for guidance for those who show superior aptitude. After the first two years, there is no significant difference between the number of dropouts in the various deciles of the measure of academic ability used by Freeman. It should be kept in mind that the grade-point-ratio does not have as significant a correlation with test scores after the first year or two, either.

Ralph F. Berdie is of the opinion that interest and personality test scores would have higher correlations with curriculum satisfaction than with the grade-point-ratio. He stated that the purpose of his study was an attempt "to determine if the satisfaction a student derives from his college course could be predicted by his responses on the Strong Vocational Interest Blank or by other predictive indices."[7]

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6 A.J. Brumbaugh, "Colleges and Universities, VIII--Student Personnel Work, Educational Counseling," Encyclopedia of Educational Research, (New York: The Macmillan Co., 1941) p. 278.

7 Ralph F. Berdie, "The Prediction of College Achievement and Satisfaction," Journal of Applied Psychology, 28:239, 1944.

He used an adaptation of the front page of Hoppock's Job Satisfaction Blank as his criterion, which was given to sophomore students at the end of the fall quarter. The grade-point-ratio proved to be more highly correlated with all indices than the curriculum satisfaction blank. The correlation between the two possible criteria is .23. The results indicated that those who attained the highest grades tended to express curriculum satisfaction, but college grades do not determine curriculum satisfaction. The study indicated that "No single factor bears a high relationship to a student's satisfaction with his curriculum."[8]

Under the present grading system the grade-point-ratio seems to be the best single criterion of success in college. An effort must be made to make this as reliable a measure as possible. Standardization of subject matter, careful construction of examinations, and a clear definition of the degree of attainment required for each grade could be expected to increase the reliability of this subjective measure.

THE PREDICTIVE EFFICIENCY OF TEST SCORES

"The most valid basis of a prediction of scholastic success in curriculum to which first year college students are admitted is the average mark made in high school."[9] This fact

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8 Ibid., p. 244.

9 Alvin C. Eurich and Leo F. Cain, "Colleges and Universities, VIII--Student Personnel Work, Prognosis," Encyclopedia of Educational Research, (New York: The Macmillan Co., 1941)p.851.

is supported by most studies, unless the group comes from a large variety of high schools.

Archer Willis Hurd reported that by objective ratings instead of the traditional grading system, and by a careful standardization of both the achievement tests and the curriculum, the validity of predictive tests can be greatly increased. He obtained a validity coefficient as high as .90 between the final ratings in the course and a predictive test battery for a group of nurses. The predictive tests and the final tests were objective examinations utilizing the same types of questions. Such a high correlation is an indication that there is a possibility of obtaining far more efficient predictions through the careful study and standardization of the variables involved.[10]

William McGehee obtained the zero order and multiple correlation coefficients for the A.C.E., the Cooperative English, and the Cooperative Mathematics tests with the grade-point-ratio for the curriculums of agriculture, engineering, textiles, vocational education, and all curricula. The multiple correlation coefficients ranged from .41 (N = 199) for agriculture to .65 (N = 46) for vocational education. The coefficients for engineering and textiles were .57 (N = 383) and .55 (N = 72), respectively. The zero order correlations ranged from

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10 Archer Willis Hurd, "The Problem of Prediction of College Success," Journal of Educational Research, 38:127-219, 1944.

.27 between mathematics and agriculture to .58 between English and vocational education. The breakdown into separate fields, and the comparison of the results with a study of the college as a whole, gives an opportunity to study the importance of making a separate investigation for each field.[11]

Marjorie E. Moore reported a comprehensive study of students in the College of Pharmacy at the University of Minnesota. The criteria were the grade-point-ratio and the score on the State Board Examination. The relative efficiency of several tests as predictors of success for students entering the College of Pharmacy as freshmen was determined. The high school percentiles had somewhat higher correlation coefficients than the tests which were used. The correlations were slightly higher for the full first year than for the first quarter first year, .488 and .436 respectively. The high school percentile rating had validity coefficients of .477 with the State Board Examination without the practical test, and .407 with the State Board Examination when the practical was included. The Pharmacy Mathematics Test II, the Johnson Science Survey, Test III, and the Iowa Chemistry Aptitude Test, Part II, proved to have the highest correlation coefficients with the freshman grades and the State

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11 William McGehee, "The Prediction of Differential Achievement in a Technological College," Journal of Applied Psychology, 27:88-92, February, 1943.

Board Examination. These varied from .436 between the total State Board Examination and the Pharmacy Mathematics Test II and .419 between the grade-point-ratio for the first quarter first year and the Johnson Science Survey, Test III, to the correlation between the Iowa Chemistry Aptitude Test, Part II, and the State Board Examination with and without the practical, .158 and .225, respectively.

The combination of variables which would best predict the success of students who entered the College of Pharmacy as sophomores was determined through multiple correlation between the predictive indices and the criteria. The combination of the Iowa Chemistry Aptitude Test, Parts II and III, and the pre-professional grade-point-ratio produced multiple correlation coefficients of .650 with the total grade-point-ratio and .678 with the State Board Examination with the practical test.

Scores for the parts of the tests were evaluated by Miss Moore, rather than the score for the whole test. It is of particular interest in relation to this study to see the use she made of the Iowa Chemistry Aptitude Test which is studied as a whole in succeeding chapters of this paper. It is interesting to note that for the most part the various predictive indices are as closely correlated with the State Board Examination as with the grade-point-ratio. The tests proved to be of varying importance as predictors of the success of students beginning as freshmen and those beginning as sophomores. For both samples,

however, the same tests, the Iowa Chemistry Aptitude Test, the Pharmacy Mathematics Test, and the Johnson Science Survey, are the most valid predictors.[12]

SUMMARY OF THE LITERATURE

Previous school achievement most accurately predicts college grades. The coefficients of correlation between general college scholarship and high school grades average about .55.[13]

The results of the studies by Douglass and Associates for the Board of Admissions of the University of Minnesota indicated that success in the curriculums which admit first year college students can be predicted most accurately, and that predictions are better for students of high or low ability than those of middling ability. "The first quarter marks in the school or college .... when added to the group of predictive variables will increase the multiple correlation from 10 to 15 points."[14]

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12 Marjorie E. Moore, "The Evaluation of Certain Factors for Predicting the Success of Students Entering the College of Pharmacy of the University of Minnesota from 1933 through 1943," Journal of Experimental Education, 14:207-224, March, 1946.

13 David Segil, Prediction of Success in College, U. S. Office of Education, Bulletin #15, (Washington: U.S. Government Printing Office, 1934) p. 70.

14 Alvin C. Eurich and Leo F. Cain, "Colleges and Universities, VIII--Student Personnel Work, Prognosis," Encyclopedia of Educational Research,(New York: The Macmillan Co., 1941) pp. 850-851.

David Segil reported that "General achievement tests at the end of the high school course are more prognostic of general college scholarship than general mental tests whereas individual tests of special traits, aptitudes and achievements, are the lowest of all for this purpose. The coefficients are .535, .440, and .367, respectively."[15]

Grades appear to bear little, if any, relation to measured interests. Interest tests are useful from the standpoint of guidance though they are not highly prognostic.[16]

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15 Segil, loc. cit.

16 Ralph F. Berdie, "The Prediction of College Achievement and Satisfaction," Journal of Applied Psychology, 28:239, 1944.

CHAPTER III

AN INTRODUCTION TO THE STUDY

PREDICTIVE INDICES

As a scientific procedure in education, prognosis involves the prediction of future attainments from accurate records of clearly defined behavior. The object is to find the correlation between a test and a certain type of life success. Judging from the reported studies by factor analysis, the factors contributing to scholastic success are not actually independent, but part of the same complex. People differ on the whole more validly than on the individual parts.[1]

An attempt has been made to determine the relative efficiency of achievement and aptitude tests as instruments for the prediction of success in the College of Pharmacy. The aptitude test supposedly tests characteristics which are indicative of future performance, in contrast to past accomplishments which are measured by achievement tests. "The achievement test is in a sense backward-looking and the aptitude test more forward-looking."[2] The tests would then be recommended for use

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1 Jane Loevinger, "A Systematic Approach to the Construction and Evaluation of Tests of Ability," Psychological Monographs, 61, no. 4: 2, 1947.

2 Albert B. Crawford and Paul S. Burnham, Forecasting College Achievement, Part I, (New Haven: Yale University Press, 1946) p. 15.

as qualifying examinations for entrance into the college. "Entrance examinations serve several purposes of which two are of primary importance: first, in discovering the adequacy of the student's educational back-ground as compared with other students of the same kind; and second, providing a basis for estimating the strengths, weaknesses, needs, and potentialities of the student."[3]

The tests analyzed in this study are the General Aptitude Test Battery of the United States Employment Service, the Iowa Chemistry Aptitude Test, the Cooperative English Examination, and the Cooperative General Achievement Tests in Social Studies, Natural Sciences, and Mathematics. Although previous studies had indicated that, next to the high school average grade, achievement tests are most likely to predict scholastic success in college, earlier aptitude tests had not employed the statistical methods used for the construction and standardization of the G.A.T.B. After a series of factorial studies had been completed, this test was constructed as an attempt to measure the following relatively "pure" aptitudes: Aptitude G--Intelligence, Aptitude V--Verbal, Aptitude N--Numerical, Aptitude S--Spatial, Aptitude P--Form Perception, Aptitude Q--Clerical Perception,

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3 K.W. Vaughn, "Basic Considerations in a Program of Freshman Evaluation," Journal of Engineering Education, 35:164, November, 1944.

Aptitude A--Aiming, Aptitude T--Motor Speed, and Aptitude L--Logic. To date on the first twenty occupational fields the latter aptitude proved to be of no use to the Employment Service; so it is not standardized as are the rest of the aptitudes. It was included to determine whether the difference in the level of persons sampled for this study would have an effect upon the validity of the test.

The Cooperative English Examination (Forms S and T), and the Cooperative General Achievement Tests (Forms S and T) are given to all entering freshmen at the University of Utah. The Iowa Chemistry Aptitude Test (Revised, Form A) is administered to all students enrolling in elementary chemistry. The students are then assigned to sections on the basis of this score and their scores on the Natural Sciences and Mathematics Achievement Tests. These tests have been used only during the past two years.

METHOD OF PROCEDURE AND SOURCES OF DATA

The College of Pharmacy was tentatively established in 1946 and has been under the direction of Dean L. David Hiner during the past school year, 1947-48. It offers a standard four year course of study leading to the degree of Bachelor of Science in Pharmacy. Students have now finished their insturction at the freshman and sophomore levels. Students who had had several quarters of college work were classified as sophomores fall

quarter, 1947. They have completed from 40 to 274 quarter hours in college work. Many are transfers from other colleges and universities. Some are graduate students. The freshmen students had very little, if any, college credit before entering the College of Pharmacy.

In the first study zero order correlation coefficients were computed between the grade-point-ratio for pharmacy subjects for 101 sophomores and the following tests: The General Aptitude Test Battery consisting of nine aptitude scores, the Cooperative English Test, the Cooperative General Achievement Tests in Social Studies, Natural Sciences, and Mathematics, and the Iowa Chemistry Aptitude Test.

In a second study zero order correlation coefficients were also computed between the grade-point-ratio in pharmacy subjects and the scores on all the tests except the G.A.T.B. for all students, regardless of class, who had completed the equivalent of one quarter's work in pharmacy subjects and had scores on all five tests. The multiple correlation coefficient was then determined.

The criterion of success in the College of Pharmacy used in this study is the grade-point-ratio for pharmacy subjects on a quarter basis. The point values assigned to each grade are on the basis of a 3.00 or an "A" grade. The grade-point-ratio is the summation for all the courses of the number of points times the credit hours divided by the total number of credit hours.

The pharmacy subjects used in determining the grade-point-ratios are those recommended by Dean Hiner and include all the courses required for graduation in the College of Pharmacy. Subjects which are general requirements of the University for graduation have not been included, since the purpose of the study is to select from the students enrolling at the University those which are likely to be successful in the College of Pharmacy rather than in other colleges or in the University at large. The subjects are pharmacy, pharmacology, pharmacognosy, bacteriology, biology, botany, chemistry, mathematics, physiology, physics, and zoology.

CHAPTER IV

STUDY I

The sample for study I as suggested by Dean Hiner, is 101 students who were enrolled in the standard sophomore course during the spring quarter, 1948. These students had completed the freshman requirements of the College of Pharmacy and were enrolled in the standard course for the third quarter of the sophomore year. The General Aptitude Test Battery was administered to them. Group I-A consists of the 38 students in Group I who have scores on the Cooperative English Test, Group I-B consists of the 37 students who have scores on the Social Studies, Natural Sciences, and Mathematics Achievement Tests, and Group I-C consists of the 39 students who have scores on the Chemistry Aptitude Test. Students who do not have scores on the chemistry test did not take their first quarter's work in elementary chemistry (required of all pharmacy students) at the University of Utah during the past two years. The Cooperative tests have been used as entrance examinations for the past two years. Students who do not have scores on the Cooperative tests did not take their entrance examinations at the University during those years. Many of the students in this group had their education interrupted by the war, and most of them had previously been enrolled in other professional colleges in various universities.

Since the students had completed from 40 to 274 hours of college work, it seemed advisable to determine the relationship between the hours of college work and the grade-point-ratio in pharmacy subjects attained at the University of Utah. The correlation coefficient for 101 students is -.025 with a standard error of .0999. For this sample the credit hours of college work has no relationship with the grade-point-ratio. The correlation coefficient between the grade-point-ratio in pharmacy subjects and the grade-point-ratio for all other courses is .520 with a standard error of .0855. This is evidence that there is a significant difference between the abilities required for success in the College of Pharmacy and general success at the University. The mean grade-point-ratio for Group I in pharmacy subjects is 1.425 compared with a mean grade-point-average in non-pharmacy subjects of 1.06. The critical ratio between the means is 5.79, indicating that the probability that this difference is caused by chance fluctuation is less than one in one thousand (see Tables 6 and 7 in the Appendix).

The entrance examinations, the Cooperative English Test and the Cooperative Achievement Tests, and the Iowa Chemistry Aptitude Test have higher validity coefficients with the grade-point-ratio than any of the aptitudes tested by the G.A.T.B. (see Table 1). The following aptitude tests have correlation coefficients high enough that the correlation is not attributable to chance fluctuation: Intelligence, Verbal, and Numerical (see Tables 8 to 21 inclusive in the Appendix).

TABLE 1

VALIDITY COEFFICIENTS FOR STUDY I

Test	Rxy	S.E.
Group I (N = 101)		
Intelligence	.396	.0843
Verbal	.315	.0901
Numerical	.315	.0901
Spatial	.184	.0966
Form Perception	.136	.0980
Clerical Perception	.262	.0931
Aiming	.167	.0972
Motor Speed	.147	.0981
Logic	.078	.0994
Group I-A (N = 38)		
English	.429	.1342
Group I-B (N = 37)		
Social Studies	.486	.1273
Natural Sciences	.450	.1329
Mathematics	.409	.1388
Group I-C (N= 39)		
Chemistry Aptitude	.480	.1249

Group I received scores approximately one standard deviation above the average grade received by the norm group on most of the aptitudes scored on the G.A.T.B. The one exception is the Clerical Perception test for which the mean for Group I is 111.7 with a standard deviation of 16, compared with a mean of 100 and a standard deviation of 20 for the norm group. The test battery was standardized on 519 individuals (70 male and 449 female) in various occupations. The mean age for the group is 30.4 years, and the mean of the years of education is 11.0. A further study was made on 6,000 cases which supports the information received on the smaller group (see Table 2).

Group I compares favorably with the norm group on the Cooperative Achievement Tests. The norms were established on 3900 students in 40 schools in the East, Middle West, and West who were completing their last year (twelfth) in high school. On the Cooperative English Test, scores for Group I are slightly lower than those for the norm group. The norms were established on the basis of 50,000 entering freshmen at 90 liberal arts colleges.

The mean score on the Chemistry Aptitude Test for Group I is substantially higher than that for the norm group, which consists of 8,394 students tested through the University of Iowa.

TABLE 2

COMPARISON OF MEAN SCORES OF GROUP I AND THE VARIOUS NORM GROUPS

TEST	STUDY I MEAN	S.D.	NORM GROUPS MEAN	S.D.
	Group I (N = 101)		(N = 519)	
Intelligence	131.4	12.8	100	20
Verbal	119.9	13.0	100	20
Numerical	137.6	15.0	100	20
Spatial	123.8	17.0	100	20
Form Perception	121.2	14.0	100	20
Clerical Perception	111.7	16.0	100	20
Aiming	117.6	14.0	100	20
Motor Speed	115.3	15.0	100	20
Logic*	16.3	3.6	xx	xx
	Group I-A (N = 38)		(N = 50,000)	
English	52.9	10.0	59.0	9.4
	Group I-B (N = 37)		(N = 3900)	
Social Studies	60.1	12.0	54.0	9.9
Natural Sciences	62.9	7.1	53.0	9.8
Mathematics	60.8	10.8	49.9	10.6
	Group I-C (N = 39)		(N = 8,394)	
Chemistry	70.5	19.0	57.0	21.0

*The score is not a standard score, but it is equal to a mean standard score of approximately 126, with a standard deviation of 13, compared with a mean of 100 and standard deviation of 20 for the norm group.

CHAPTER V

STUDY II

Since only eighteen students have scores on all the tests, comparisons between tests used in Study I were not possible on a large enough sample. A larger sample was selected to check the reliability of the correlation coefficients between the grade-point-ratio and the Cooperative Achievement Tests, the English Test, and the Chemistry Aptitude Test. All students including the eighteen mentioned above who had the equivalent of one full quarter's work, twelve or more credit hours, in pharmacy subjects and had scores on the English Test, the Achievement Tests, and the Chemistry Test were selected as the sample. There are 76 such students.

The zero order correlation coefficients between the criterion and the Natural Sciences Achievement Test and the Chemistry Aptitude Test are the highest, .457 and .450, respectively. The Mathematics test has the lowest validity coefficient (see Table 3 and Tables 24 to 28 inclusive in the Appendix).

TABLE 3

VALIDITY COEFFICIENTS FOR STUDY II

(N = 76)

Test	Rxy	S.E.
English	.443	.0928
Social Studies	.413	.0957
Natural Sciences	.457	.0913
Mathematics	.323	.1035
Chemistry Aptitude	.450	.0902

The Wherry-Doolittle test selection method was applied to the data. This is "a method for selecting a battery of tests that will give the maximum shrunken multiple correlation with the criterion; that is, the maximum multiple correlation after a correction has been made for the chance error added by each test."[1] When the addition of another test adds more chance error than actual validity to the battery, the Wherry shrinkage formula will indicate that the addition of more tests is not feasible. The following tests are found to contribute to the maximum shrunken multiple correlation coefficient of .531: the Natural Sciences Test, the Chemistry Aptitude Test, the Social Studies Test, and the Mathematics Test. The multiple correlation of these tests without application of the Wherry shrinkage formula would be .577 (see Table 39 in the Appendix).

TABLE 4

RELATIVE WEIGHTS OF TESTS

Test	Weight
Natural Sciences	.030303
Social Studies	.024115
Chemistry Aptitude	.015844
Mathematics	-.030893

1 William H. Stead, Carroll L. Shartle, et al, Occupational Counseling Techniques, (New York: American Book Company, 1940) p. 245.

The Mathematics Achievement Test increases the validity of the test battery by eliminating part of the error introduced by the other three tests. It purifies the test battery. Without the addition of the Mathematics Test, the maximum shrunken multiple validity coefficient would not be obtained. It is therefore recommended that the test be included in the test battery.

By multiplying the scores on the tests by their respective weights, one can determine the most probable grade-point-ratio in the College of Pharmacy. On the basis of the sample group, conversion tables have been set up (see Table 40 in the Appendix).

The mean grade-point-ratio for Group II in pharmacy subjects at the University of Utah is .98 with a standard deviation of .876. The mean grade-point-ratio for these students in non-pharmacy subjects is 1.34 with a standard deviation of .569 (see Table 22 in the Appendix). The critical ratio between these means is 6.102, indicating that the difference between the means can be attributed to chance fluctuation less than one-tenth of one per cent of the time (see Page 20).

The means for the various tests are similar for the two groups. The correlation coefficient is considerably lower for the Social Studies Test and the Chemistry Aptitude Test for Group II than Group I (see Table 5).

There are some variations in the relative importance of the various tests on the basis of zero order correlation coefficients between the two studies. Since the standard error is smaller for Study II and the multiple correlation coefficient is available for the test battery, it would seem advisable to assume that the corresponding order of importance of each test is more valid for Study II.

TABLE 5

COMPARISON OF STUDY I WITH STUDY II

Test	Study I				Study II			
	Rxy	S.E.	Mean	S.D.	Rxy	S.E.	Mean	S.D.
English	.429	.1342	52.9	10.0	.443	.0928	50.4	9.8
Social Studies	.486	.1273	60.1	12.0	.413	.0957	56.5	9.4
Natural Sciences	.450	.1329	62.9	7.1	.457	.0913	61.4	6.0
Mathematics	.409	.1288	60.8	10.8	.323	.1035	58.3	5.9
Chemistry Aptitude	.480	.1249	70.5	19.0	.450	.0920	71.4	21.7

CHAPTER VI

SUMMARY AND CONCLUSIONS

SUMMARY

This study was undertaken to assist with the guidance of students interested in entering the College of Pharmacy at the University of Utah. An attempt has been made to discover some means by which to measure the abilities required for success in this college. Two studies were made to determine the efficiency of selected tests as predictive indices.

The criterion of success in the College of Pharmacy is the grade-point-ratio in pharmacy subjects: pharmacy, pharmacology, pharmacognosy, bacteriology, biology, botany, chemistry, mathematics, physiology, physics, and zoology.

Sophomore students who were enrolled in the standard third-quarter sophomore course were used as the sample for Study I. The General Aptitude Test Battery of the United States Employment Service was administered to them, and other test scores were obtained from the University records for each student. Validity coefficients were computed between the criterion and the scores on each of the following tests: the Cooperative English Test; the Cooperative Achievement Tests in Social Studies, Natural Sciences, and Mathematics; the Iowa Chemistry Aptitude Test; and the C.A.T.B., which consists of aptitude scores for Intelligence, Verbal, Numerical, Spatial, Form Perception, Clerical Perception, Aiming, Motor Speed, and Logic Aptitudes.

FINDINGS

The Cooperative English Test, the Cooperative Achieve-

ment Tests, and the Iowa Chemistry Aptitude Test have higher coefficients of correlation with the criterion than any of the aptitudes tested by the G.A.T.B.: .429 for English (N = 38), .486 for Social Studies (N = 37), .450 for Natural Sciences (N = 37), .409 for Mathematics (N = 37), and .480 for Chemistry (N = 39). The three highest correlation coefficients between the criterion and the G.A.T.B. (N = 101) are .396 for Intelligence, .315 for Verbal, and .315 for Numerical. The sample used for the G.A.T.B. is larger and more heterogeneous than that used for the other tests, but the standard error is smaller for the larger sample. Because of these differences, the validity coefficients for the samples cannot be directly compared with one another.

A second study was made, omitting the G.A.T.B., to check the validity of the correlation coefficients for Study I. The sample for this study includes all students who had completed the equivalent of one quarter's work in pharmacy subjects and who had scores on all of the tests in question, a total of 76 students. The zero order correlation coefficients are as follows: Cooperative English Test, .443; Social Studies Test, .413 ; Natural Sciences Test, .457; Mathematics Test, .323; and the Chemistry Aptitude Test, .450.

The Wherry-Doolittle multiple correlation formula was applied to the data for Study II. The maximum shrunken multiple correlation coefficient between the test battery and the cri-

terion is .531. The non-shrunken multiple correlation coefficient is .577. These coefficients are obtained by the combination of the Natural Sciences Test, the Social Studies Test, the Mathematics Test, and the Chemistry Aptitude Test.

CONCLUSIONS AND RECOMMENDATIONS

The Cooperative English Test, the Cooperative General Achievement Tests, and the Chemistry Aptitude Test are more useful as predictive indices of success in the College of Pharmacy at the University of Utah than the General Aptitude Test Battery of the tests used in Study II. The test battery which best predicts success in the College of Pharmacy at the University of Utah consists of the Chemistry Aptitude Test and the Cooperative General Achievement Tests in Social Studies, Natural Sciences, and Mathematics. It is recommended that these tests be used, with all other information available about the student to select students for the College of Pharmacy.

If a cutting score is used, it should be established in relation to the percentage of applicants which can be admitted. Since the College of Pharmacy at the University of Utah is a new college, no policy of admissions has as yet been determined. On the basis of the most probable grade-point-ratio, as derived from the weighted predicted scores obtained from the test battery, cutting scores would have the following significance:

> If the cutting score were set at 1.00, 50% of the students receiving a predicted grade-point-ratio from the test battery of 1.00 should actually make a grade-point-ratio of 1.00 or better. If the cutting score were set at 0.75, 38% of the students receiving that predicted score should attain a grade-point-ratio of 100 or better. If the cutting score were set at 0.50, 26% of those making this predicted score should attain at least a 1.00 average, and if it were set as low as 0.25, only 16% of those receiving that predicted score should attain at least a 1.00 average.

The predicted grade-point-ratio may be obtained by converting the test scores to the scaled weights listed on Table 40 and adding the respective weights. On the basis of these percentages a cutting score might be set by the college of Pharmacy to fit its needs at the present time.

The principle purpose of the test battery is to assist with the guidance of those students wishing to select a major field of endeavor. The battery should serve as an instrument which will assist the student to analyze more objectively his chances of success in the College of Pharmacy at the University of Utah.

The selection of a major field is dependent upon many factors--academic ability, interests, personal qualities, physical condition, financial resources, and others. This study provides the student and the counselor with the degree of validity with which certain test scores predict success in the Pharmacy College. The validity coefficients between measures of other factors that might contribute to success in this college and the criterion are unknown. Objective studies of

other aspects of this problem would be valuable. On the basis of related studies, it might be expected that the previous school record would add to the validity of the prediction of success. It is probable that interest and personality tests would not have as high a predictive value as other measures, although they are valuable from a guidance viewpoint for providing insight about qualities of the individual which are not measured by the test battery or a student's previous record.

Parts of the General Aptitude Test Battery have a significant correlation with the grade-point-ratio in pharmacy. It is recommended that another study be made to determine the validity coefficient that might be attained by the combination of parts of the General Aptitude Test Battery with the test battery recommended as a result of this study. A follow-up study to determine the consistency of the degree of validity reported in this study is recommended because of the fact that the students had a heterogeneous background and were enrolled in a new and unstable curriculum for more than a year.

On the basis of this study, there is a significant difference between success in pharmacy and success in non-pharmacy subjects. Comparable studies to determine the predictive efficiency of these tests with regard to success in other colleges at the University of Utah would increase the guidance value of the results of this study.

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TABLE 6

G.P.R. PHARMACY SUBJECTS vs. G.P.R. NON-PHARMACY SUBJECTS

G.P.R. Pharmacy	f	2.81-3.00	2.61-2.80	2.41-2.60	2.21-2.40	2.01-2.20	1.81-2.00	1.61-1.80	1.41-1.60	1.21-1.40	1.01-1.20	.81-1.00	.61-.80	.41-.60	.21-.40
2.81-3.00	0														
2.61-2.80	0														
2.41-2.60	4														
2.21-2.40	5														
2.01-2.20	7					1		1							
1.81-2.00	6			2	1		1	2							
1.61-1.80	2						1		1						
1.41-1.60	12	1		1	2	2	4	2							
1.21-1.40	12			1	2	1	3			4	1				
1.01-1.20	6				2		2	1	1						
.81-1.00	11				3	3	2	1	1	1					
.61-.80	3	2						1							
.41-.60	3	1					1	1							
.21-.40	3				1			1		1					
	f	4	0	5	10	8	16	7	7	9	4	1	2	1	0
		.21-.40	.41-.60	.61-.80	.81-1.00	1.01-1.20	1.21-1.40	1.41-1.60	1.61-1.80	1.81-2.00	2.01-2.20	2.21-2.40	2.41-2.60	2.61-2.80	2.81-3.00

G.P.R. Non-Pharmacy

Rxy .520 Mx 1.06 My 1.425

S.D. .0855 S.D. .52 S.D. .58

diff. .063 C.R. 5.79

N 74

TABLE 7

GRADE-POINT-RATIO vs. TOTAL HOURS OF COLLEGE WORK

G.P.R.	f	36-55	56-75	76-95	96-115	116-135	136-155	156-175	176-195	196-215	216-235	236-255	256-275	276-295
2.81-3.00	2		1		1									
2.61-2.80	1			1										
2.41-2.60	4		2	2										
2.21-2.40	7	1	2	2		1				1				
2.01-2.20	8		1	3	3		1							
1.81-2.00	9		1		2	3	1	1			1			
1.61-1.80	5	1		1	2		1							
1.41-1.60	15		6	1	2	1		1			1		2	1
1.21-1.40	18	2	5	1	2	3	2	2		1				
1.01-1.20	8	1	2				1		2		2			
.81-1.00	15	3	6	3	1	2								
.61-.80	3		2									1		
.41-.60	3		1	2										
.21-.40	3		1		1					1				
		8	30	16	14	10	6	4	2	3	4	1	2	1
	f													
	Hours													

Rxy -.025 Mx 108.7 My 1.485

S.E. .0999 S.D. 56.0 S.D. .59

N 101

TABLE 8

GRADE-POINT-RATIO vs. THE COOPERATIVE ENGLISH TEST

G.P.R.	f	33-36	37-40	41-44	45-48	49-52	53-56	57-60	61-64	65-68	69-72	73-76	77-80
2.81-3.00	0												
2.61-2.80	0												
2.41-2.60	3							1		1	1		
2.21-2.40	2				1					1			
2.01-2.20	4					1	1	1					1
1.81-2.00	2						1			1			
1.61-1.80	2	1					1						
1.41-1.60	4		1		1	2							
1.21-1.40	5		1			1		3					
1.01-1.20	5		1	1		2				1			
.81-1.00	7			2	1	1	1	1		1			
.61-.80	2					1	1						
.41-.60	1	1											
.21-.40	1					1							
	f	2	3	3	3	9	5	6	0	5	1	0	1
	English												

Rxy .429 Mx 52.9 My 1.425

S.E. .1342 S.D. 10.0 S.D. .59

N 38

TABLE 9

GRADE-POINT-RATIO vs. THE COOPERATIVE SOCIAL STUDIES TEST

G.P.R.	f	41-44	45-48	49-52	53-56	57-60	61-64	65-68	69-72	73-76	77-80	81-84	85-88	89-92	93-96	Social Studies
2.81-3.00	1														1	
2.61-2.80	0															
2.41-2.60	3						1			1		1				
2.21-2.40	2				1						1					
2.01-2.20	3				1		1	1								
1.81-2.00	1						1									
1.61-1.80	3	1			1				1							
1.41-1.60	4			2	1	1										
1.21-1.40	6	1	1		1	1	1				1					
1.01-1.20	5	1		1		1	1		1							
.81-1.00	5		1			2	1		1							
.61-.80	2					2										
.41-.60	1		1													
.21-.40	1					1										
	f	3	3	3	5	8	6	1	3	1	2	1	0	0	1	

Rxy .486 Mx 60.1 My 1.465

S.E. .1273 S.D. 12.0 S.D. .62

N 37

TABLE 10

GRADE-POINT-RATIO vs. THE COOPERATIVE NATURAL SCIENCES TEST

G.P.R.	f	49-51	52-54	55-57	58-60	61-63	64-66	67-69	70-72	73-75	76-78	79-81	81-84
2.81-3.00	1												1
2.61-2.80	0												
2.41-2.60	3							1	1		1		
2.21-2.40	2				1				1				
2.01-2.20	3				1	1		1					
1.81-2.00	1				1								
1.61-1.80	3			2						1			
1.41-1.60	4			1	1		2						
1.21-1.40	6	1		1	2	1		1					
1.01-1.20	5		2	1				1	1				
.81-1.00	5				1	1	2	1					
.61-.80	2				1	1							
.41-.60	1			1									
.21-.40	1						1						
		1	2	6	8	4	5	5	3	1	1	0	1

f

Natural Sciences

Rxy .450 Mx 62.9 My 1.465

S.E. .1329 S.D. 7.1 S.D. .62

N 37

TABLE 11

GRADE-POINT-RATIO vs. THE COOPERATIVE MATHEMATICS TEST

G.P.R.	f	49-51	52-54	55-57	58-60	61-63	64-66	67-69	70-72	73-75	76-78	79-81
2.81-3.00	1											1
2.61-2.80	0											
2.41-2.60	3						1	1	1			
2.21-2.40	2			1			1					
2.01-2.20	3				2	1						
1.81-2.00	1				1							
1.61-1.80	3		1	1					1			
1.41-1.60	4	1			1		1	1				
1.21-1.40	6	1	1	1	2		1					
1.01-1.20	5				2	1	1			1		
.81-1.00	5			2		2		1				
.61-.80	2	1			1							
.41-.60	1	1										
.21-.40	1					1						
	f	4	2	5	9	5	5	3	2	1	0	1

Mathematics

Rxy .409 Mx 60.8 My 1.465

S.E. .1388 S.D. 6.8 S.D. .62

N 37

TABLE 12

GRADE-POINT-RATIO vs. THE IOWA CHEMISTRY APTITUDE TEST

G.P.R.	f	15-21	22-28	29-35	36-42	43-49	50-56	57-63	64-70	71-77	78-84	85-91	92-98	99-105
2.81-3.00	0													
2.61-2.80	0													
2.41-2.60	1										1			
2.21-2.40	3										2			1
2.01-2.20	4							2	1			1		
1.81-2.00	4							1		1		2		
1.61-1.80	2					1							1	
1.41-1.60	5									2			3	
1.21-1.40	7					1		2	2			1	1	
1.01-1.20	2								1			1		
.81-1.00	7			1		1	2	1		1	1			
.61-.80	2							1			1			
.41-.60	1						1							
.21-.40	1	1												
	f	1	0	1	0	3	3	7	4	4	5	5	5	1

Chemistry Aptitude

Rxy .480 Mx 70.5 My 1.345

S.E. .1249 S.D. 19.0 S.D. .55

N 39

TABLE 13

GRADE-POINT-RATIO vs. G.A.T.B. APTITUDE G: INTELLIGENCE

G.P.R.	f	101-106	107-112	113-118	119-124	125-130	131-136	137-142	143-148	149-154	155-160	161-166	167-172	173-178	179-184	185-190
2.81-3.00	2					1										1
2.61-2.80	1								1							
2.41-2.60	4						2		1	1						
2.21-2.40	7				2		1	2		2						
2.01-2.20	8			1		2	2	1		2						
1.81-2.00	9		1		2	2	1	1	1	1						
1.61-1.80	5			1	2	1		1								
1.41-1.60	15	1	1	1	2	1	4	2	3							
1.21-1.40	18		1	2	2	7	2	3		1						
1.01-1.20	8				3		2	2	1							
.81-1.00	15		1	3	3	3	2		3							
.61-.80	3		1	1		1										
.41-.60	3			2			1									
.21-.40	3				1	1	1									
		1	5	11	17	19	18	12	10	7	0	0	0	0	0	1

f

Aptitude G

Rxy .396 Mx 131.4 My 1.485

S.D. .0843 S.D. 12.8 S.D. .59

N 101

TABLE 14

GRADE-POINT-RATIO vs. G.A.T.B. APTITUDE V: VERBAL

G.P.R.	f	87-92	93-98	99-104	105-110	111-116	117-122	123-128	129-134	135-140	141-146	147-152	153-158	159-164	165-170
2.81-3.00	2							1							1
2.61-2.80	1						1								
2.41-2.60	4							1	1		2				
2.21-2.40	7	1					3			1	1		1		
2.01-2.20	8				1	1	1	1	1	2	1				
1.81-2.00	9				1	2	2	2	1		1				
1.61-1.80	5	1	1					3							
1.41-1.60	15			1	5	1	3	4	1						
1.21-1.40	18			1	6	5	1	2	2	1					
1.01-1.20	8				1	1	1	4	1						
.81-1.00	15			2	3	3	4	2		1					
.61-.80	3				1	1			1						
.41-.60	3			1		1				1					
.21-.40	3				1		1			1					
		2	1	5	19	16	17	19	8	7	5	0	1	0	1
														Aptitude V	

Rxy .315 Mx 119.9 My 1.485

S.E. .0901 S. D. 13.0 S.D. .59

N 101

TABLE 15

GRADE-POINT-RATIO vs. G.A.T.B. APTITUDE N: NUMERICAL

G.P.R.	f	105-110	111-116	117-122	123-128	129-134	135-140	141-146	147-152	153-158	159-164	165-170	171-176
2.81-3.00	2					1						1	
2.61-2.80	1									1			
2.41-2.60	4					1		2		1			
2.21-2.40	7						2		3	2			
2.01-2.20	8				1		1		2	2	2		
1.81-2.00	9			2			1		1	1	2	2	
1.61-1.80	5				1	1		1	2				
1.41-1.60	15		1	1	2	3	1	1	2	3	1		
1.21-1.40	18		1			4	3	4	2	3	1		
1.01-1.20	8			1		2		1		3		1	
.81-1.00	15		2		4	1	1		4		1	1		1
.61-.80	3				2					1				
.41-.60	3				1	1	1							
.21-.40	3				1			1	1					
	f		4	4	12	12	10	10	16	16	11	4	1	1
	Aptitude N													

Rxy .315 Mx 137.6 My 1.485

S.E. .0901 S. D. 15.0 S.D. .59

N 101

TABLE 16

GRADE-POINT-RATIO vs. G.A.T.B. APTITUDE S: SPATIAL

G.P.R.	f	75-80	81-86	87-92	93-98	99-104	105-110	111-116	117-122	123-128	129-134	135-140	141-146	147-152	153-158
2.81-3.00	2										1				1
2.61-2.80	1										1				
2.41-2.60	4							1		2		1			
2.21-2.40	7		1				1				1	2	1	1	
2.01-2.20	8			1		1		1	1	2	1			1	
1.81-2.00	9					1	1	1	1	2	1	1		1	
1.61-1.80	5						1	1	1		1		1		
1.41-1.60	15				2			1		3	1		4	2	2
1.21-1.40	18				2		3		6		3	2	1	1	
1.01-1.20	8				1			1	1	1	3		1		
.81-1.00	15				1	2	1	5		1		1	3	1	
.61-.80	3	1						1	1						
.41-.60	3					1	1	1							
.21-.40	3						1				1	1			
	1	1	1	1	6	5	9	13	11	11	14	8	11	7	3

f

Aptitude S

Rxy .184 Mx 123.8 My 1.485

S. E. .0966* S.D. 17.0 S.D. .59

N 101 * Rxy is not significant

TABLE 17

GRADE-POINT-RATIO vs. G.A.T.B. APTITUDE P: FORM PERCEPTION

G.P.R.	f	86-90	91-95	96-100	101-105	106-110	111-115	116-120	121-125	126-130	131-135	136-140	141-145	146-150
2.81-3.00	2									2				
2.61-2.80	1					1								
2.41-2.60	4							1		1		2		
2.21-2.40	7				1	2				2	2			
2.01-2.20	8				1			1	2	1	2		1	
1.81-2.00	9			2	1		2		1		1	1	1	
1.61-1.80	5							2			2		1	
1.41-1.60	15				3	1	1	1	5		1	2		1
1.21-1.40	18		1	2	1		1	2	4	3	3	1		
1.01-1.20	8			1		1			2	1	1		1	1
.81-1.00	15		1		1	3	1		4	2		3		
.61-.80	3	1			1		1							
.41-.60	3						1		1	1				
.21-.40	3						2				1			
	f	1	2	5	9	8	9	7	19	13	13	9	4	2
	Aptitude P													

Rxy .136 Mx 121.2 My 1.485

S.E. .0982* S.D. 14.0 S.D. .59

N 101 * Rxy is not significant

TABLE 18

GRADE-POINT-RATIO vs. G.A.T.B. APTITUDE Q: CLERICAL PERCEPTION

G.P.R.	f	77-82	83-88	89-94	95-100	101-106	107-112	113-118	119-124	125-130	131-136	137-142	143-148	149-154
2.81-3.00	2					1						1		
2.61-2.80	1				1									
2.41-2.60	4							2			1			1
2.21-2.40	7				1	3		2		1				
2.01-2.20	8						3	1	1			3		
1.81-2.00	9			1	1	2			2	1	1			1
1.61-1.80	5				1			3			1			
1.41-1.60	15			2	2	3	3	2	1		2			
1.21-1.40	18		1	4	3	3	2		2	1	1	1		
1.01-1.20	8					1	2	1	1		1	1	1	
.81-1.00	15	1		1	5	2	2	2	1	1				
.61-.80	3				1	1			1					
.41-.60	3				1	1	1							
.21-.40	3				2					1				
	f	1	2	7	18	17	13	13	9	5	7	6	1	2

Aptitude Q

Rxy .262 Mx 111.7 My 1.485

S.D. .0931* S.D. 16.0 S.D. .59

N 101 * Rxy is not significant

TABLE 19

GRADE-POINT-RATIO vs. G.A.T.B. APTITUDE A: AIMING

G.P.R.	f	72-82	83-88	89-94	95-100	101-106	107-112	113-118	119-124	125-130	131-136	137-142	143-148	149-154	155-160
2.81-3.00	2							1							1
2.61-2.80	1						1								
2.41-2.60	4						1		1	1	1				
2.21-2.40	7						2	3	1		1				
2.01-2.20	8				1	3		2	1		1				
1.81-2.00	9	1			2		1	1		1		1	2		
1.61-1.80	5								2		3				
1.41-1.60	15				3		3	1	1	3	3	1			
1.21-1.40	18		1			2	2	6		4	1	1	1		
1.01-1.20	8					1	2	1	1	1	1	1			
.81-1.00	15		1				3	4	5		2				
.61-.80	3					1		2							
.41-.60	3						2	1							
.21-.40	3		1		1			1							
	f	1	3	0	7	7	17	23	12	10	13	4	3	0	1

Aptitude A

Rxy .167 Mx 117.6 My 1.485

S.E. .0972* S.D. 14.0 S.D. .59

N 101 * Rxy is not significant

TABLE 20

GRADE-POINT-RATIO vs. G.A.T.B. APTITUDE T: MOTOR SPEED

G.P.R.	f	77-82	83-88	89-94	95-100	101-106	107-112	113-118	119-124	125-130	131-136	137-142	143-148	149-154	f
2.81-3.00	2								1			1			
2.61-2.80	1							1							
2.41-2.60	4						1		2	1					
2.21-2.40	7				1		2		3	1					
2.01-2.20	8		1			3		1		2	1				
1.81-2.00	9		1	1	1			3		2				1	
1.61-1.80	5						1	1		1	1	1			
1.41-1.60	15		1		2	4	1		4	2	1				
1.21-1.40	18	1		2		1		2	5	4	2		1		
1.01-1.20	8		1			1	2	1		1		1		1	
.81-1.00	15		1		1		2	4	3	3	1				
.61-.80	3				1		1	1							
.41-.60	3		1	1		1									
.21-.40	3				1		1		1						
		1	6	4	7	10	11	14	19	17	6	3	1	2	f
															Aptitude T

Rxy .147 Mx 115.3 My 1.485

S.E. .0931* S.E. 15.0 S.D. .59

N 101 * Rxy is not significant

TABLE 21

GRADE-POINT-RATIO vs. G.A.T.B. APTITUDE L: LOGIC

G.P.R.	f																		
2.81+ 3.00	2									1	1								
2.61+ 2.80	1										1								
2.41+ 2.60	4										1				2		1		
2.21+ 2.40	7					1						1	1	1	1				1 1
2.01+ 2.20	8				1	1						2			1	2		1	
1.81+ 2.00	9				1	1	1				1	1	1	1		2			
1.61+ 1.80	5						1		2				1					1	
1.41+ 1.60	15	1						1	2	1	1	3		1	1	2			
1.21+ 1.40	18					1	1		2	1	2	1	4	1	1	3	1		
1.01+ 1.20	8									2		1	2		1		2		
.81+ 1.00	15				1			2		3	1	1	1	1	4			1	
.61+ .80	3										2	1							
.41+ .60	3							1				1		1					
.21+ .40	3									1	1		1						
		1	0	0	3	4	3	4	6	9	11	12	11	6	11	9	4	3	3 1
																Aptitude L			
		6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23 24

Rxy .078 Mx 16.3 My 1.485

S.E. .0994* S.D. 3.6 S.D. .59

N 101 * Rxy is not significant

TABLE 22

G.P.R. PHARMACY SUBJECTS vs. G.P.R. NON-PHARMACY SUBJECTS

G.P.R. Pharmacy	f	2	3	7	10	11	16	6	15	1	3	1	1
2.71-3.00	2											1	1
2.41-2.70	3								2		1		
2.11-2.40	5								2	1	2		
1.81-2.10	2								2				
1.51-1.80	6					1	2	1	2				
1.21-1.50	14			1		2	5	3	3				
.91-1.20	10				2	2	3		3				
.61-.90	6		2		1		2	1					
.31-.60	14	1			4	5	1	1	1				
.01-.30	2			1			1						
-.29-.00	6		1	3	1		1						
-.59--.30	2			1	1								
-.89--.60	4	1		1	1		1						

			2	3	7	10	11	16	6	15	1	3	1	1		f				
			.01-.25	.26-.50	.51-.75	.76-1.00	1.01-1.25	1.26-1.50	1.51-1.75	1.76-2.00	2.01-2.25	2.26-2.50	2.51-2.75	2.76-3.00		G.P.R. Non-Pharmacy				

Rxy .756 Mx 1.34 My .98

S.E. .0494 S.D. .57 S.D. .88

σdiff .059 C.R. 6.10

N 76

TABLE 23

GRADE-POINT-RATIO vs. TOTAL HOURS OF COLLEGE WORK

G.P.R.	f	21-28	29-36	37-44	45-52	53-60	61-68	69-76	77-84	85-92	93-100	101-108	109-116	117-124	125-132	Hours	f
2.71-3.00	2		1	1													
2.41-2.70	3		2						1								
2.11-2.40	5		2		1					2							
1.81-2.10	2		1	1													
1.51-1.80	6		1				1	2		1			1				
1.21-1.50	14	1	4	1	1	3	1				1		1		1		
.91-1.20	10	2		1		2	2	2			1						
.61-.90	6		3			2	1										
.31-.60	14	4	8			1		1									
.01-.30	2		2														
-.29-.00	6	4	1		1												
-.59-.30	2	1	1														
-.89-.60	4	4															
		16	26	4	3	8	5	5	1	3	2	0	2	0	1		f

Rxy .387 Mx 47.0 My .98

S.E. .0982 S.D. 24.5 S.D. .88

N 76

TABLE 24

GRADE-POINT-RATIO vs. THE CHEMISTRY APTITUDE TEST

G.P.R.	f	15-22	23-30	31-38	39-46	47-54	55-62	63-70	71-78	79-86	87-94	95-102	103-110	111-118
2.71-3.00	2									1	1			
2.41-2.70	3									1			1	1
2.11-2.40	5			1			3			1				
1.81-2.10	2									1	1			
1.51-1.80	6					2	1		1	1		1		
1.21-1.50	14			1		2	4	3	1	1	1	1		
.91-1.20	10			1	3	2	1		1	1	1			
.61-.90	6					1	1	1	1	2				
.31-.60	14	1		2	4	2	2			2		1		
.01-.30	2	1			1									
-.29-.00	6	1		1		1	1		1		1			
-.59-.30	2	1				1								
-.89-.60	4				1	2		1						
	f	4	9	6	9	13	13	5	5	11	5	3	1	1
	Chemistry Aptitude													

Rxy .450 Mx 71.4 My .98

S.E. .0920 S.D. 21.7 S.D. .88

N 76

TABLE 25

GRADE-POINT-RATIO vs. THE COOPERATIVE ENGLISH TEST

G.P.R.	f	27-30	31-34	35-38	39-42	43-46	47-50	51-54	55-58	59-62	63-66	67-70	71-74	75-78
2.71-3.00	2										1	1		
2.41-2.70	3									1	1			1
2.11-2.40	5					2		1	1	1				
1.81-2.10	2							1		1				
1.51-1.80	6				2		1	2					1	
1.21-1.50	14				1			3	2	4	2	1	1	
.91-1.20	10				2		1	4		2	1			
.61-.90	6					3	1		1	1				
.31-.60	14		1		2	1	1	5		2	1	1		
.01-.30	2							2						
-.29-.00	6			1				2		2	1			
-.59--.30	2				1			1						
-.89--.60	4				1	2	1							
	f	1	1	9	6	7	19	5	12	8	4	2	1	1
		27-30	31-34	35-38	39-42	43-46	47-50	51-54	55-58	59-62	63-66	67-70	71-74	75-78

English

Rxy .443 Mx 50.4 My .98

S.E. .0928 S.D. 9.8 S.D. .88

N 76

TABLE 26

GRADE-POINT-RATIO vs. THE COOPERATIVE SOCIAL STUDIES TEST

G.P.R.	f	37-40	41-44	45-48	49-52	53-56	57-60	61-64	65-68	69-72	73-76	77-80	81-84	85-88
2.71-3.00	2							1	1					
2.41-2.70	3							1	1					1
2.11-2.40	5				1	1		2	1					
1.81-2.10	2						1				1			
1.51-1.80	6		1		1	2		1	1					
1.21-1.50	14		1	1	1	1	3	3	2		1	1		
.91-1.20	10		1	1		3	5							
.61-.90	6	1		1		2	2							
.31-.60	14		1	5	2	3				1	2			
.01-.30	2				1	1								
-.29-.00	6		1		1	2	1		1					
-.59-.30	2					1	1							
-.89-.60	4		1	1	2									
	f	1	6	9	9	16	13	8	7	1	4	1	0	1
	Social Studies													

Rxy .413 Mx 56.5 My .98

S.E. .0957 S.D. 9.4 S.D. .88

N 76

TABLE 27

GRADE-POINT-RATIO vs. THE COOPERATIVE NATURAL SCIENCES TEST

G.P.R.	f	49-50	51-52	53-54	55-56	57-58	59-60	61-62	63-64	65-66	67-68	69-70	71-72	73-74	75-76
2.71-3.00	2											1		1	
2.41-2.70	3											2			1
2.11-2.40	5						2	1		1		1			
1.81-2.10	2								1		1				
1.51-1.80	6				2	1	1		1			1			
1.21-1.50	14	1				2	3	1	1	1	3	1			1
.91-1.20	10			2		1	2			4	1				
.61-.90	6			1		1	2	1			1				
.31-.60	14			1		8		1	1	2		1			
.01-.30	2					1		1							
-.29-.00	6	1	1						1	1	1		1		
-.59-.30	2			1					1						
-.89-.60	4	1		1	1	1									
	f	3	1	6	3	15	10	5	10	7	5	7	1	1	2
	Natural Sciences	49-50	51-52	53-54	55-56	57-58	59-60	61-62	63-64	65-66	67-68	69-70	71-72	73-74	75-76

Rxy .457 Mx 61.4 My .98

S.E. .0913 S.D. 6.0 S.D. .88

N 76

TABLE 28

GRADE-POINT-RATIO vs. THE COOPERATIVE MATHEMATICS TEST

G.P.R.	f	49-50	51-52	53-54	55-56	57-58	59-60	61-62	63-64	65-66	67-68	69-70	71-72	73-74	75-76	77-78
2.71-3.00	2					1				1						
2.41-2.70	3									1	1				1	
2.11-2.40	5			1	1	1	1	1								
1.81-2.10	2								1			1				
1.51-1.80	6	1		1	2		1					1				
1.21-1.50	14	1	1	1	1	2	3	1	1	2	1					
.91-1.20	10	1	2	1	1	3		2	1							
.61-.90	6				2		3		1							
.31-.60	14	3	1	1	3	2		2	1						1	
.01-.30	2			1			1									
-.29-.00	6	2				1	1	1		1						
-.59-.30	2		1			1										
-.89-.60	4	1			1	2										
	f	8	5	6	11	13	10	7	5	5	2	2	0	0	1	1
														Mathematics		

Rxy .323 Mx 58.3 My .98

S.D. .1035 S.D. 5.9 S.D. .88

N 76

TABLE 29

THE CHEMISTRY TEST vs. THE ENGLISH TEST

Chemistry	f	27-30	31-34	35-38	39-42	43-46	47-50	51-54	55-58	59-62	63-66	67-70	71-74	75-78
111-118	1													1
103-110	1										1			
95-102	3						3							
87-94	5			1			1	1	1			1		
79-86	11					2		1	2	3	2		1	
71-78	5			1	1		1		2					
63-70	5				1				2	1		1		
55-62	13			1	1	2	3	1	4	1				
47-54	13	1		2	2	1	4	1		2				
39-46	9			1	1		5		1	1				
31-38	6			2		2	1	1						
23-30	0													
15-22	4		1	1			1				1			
	f	1	1	9	6	7	19	5	12	8	4	2	1	1
	English													

Rxy .416 Mx 50.4 My 71.4

S.D. .0955 S.D. 9.8 S.D. 21.7

N 76

TABLE 30

THE CHEMISTRY TEST vs. THE SOCIAL STUDIES TEST

Chemistry f		37-40	41-44	45-48	49-52	53-56	57-60	61-64	65-68	69-72	73-76	77-80	81-84	85-88
111-118	1													1
103-110	1								1					
95-102	3			1		1	1							
87-94	5		1			1	2	1						
79-86	11					3	2	1	2		3			
71-78	5			2	1		2							
63-70	5				1		1	3						
55-62	13	1	1	1	1	3		2	3		1			
47-54	13		2	2	1	3	2	1	1			1		
39-46	9		1	2	2	3	1							
31-38	6			1	3		2							
23-30	0													
15-22	4		1			2				1				
		1	6	9	9	16	13	8	7	1	4	1	0	1

Social Studies f

Rxy .315 Mx 56.5 My 71.4

S.E. .1040 S.D. 9.4 S.D. 21.7

N 76

TABLE 31

THE CHEMISTRY APTITUDE TEST vs. THE NATURAL SCIENCES TEST

Chemistry	f	49-50	51-52	53-54	55-56	57-58	59-60	61-62	63-64	65-66	67-68	69-70	71-72	73-74	75-76	Natural Sciences
111-118	1														1	
103-110	1											1				
95-102	3					1	1			1						
87-94	5			1				1		1	1			1		
79-86	11						2	1	2	2		3			1	
71-78	5				1	1	1			1	1					
63-70	5					1	1			1	1	1				
55-62	13	1		1		2	2		2	1	1	2	1			
47-54	13	1		1	2	4	1		2		1					
39-46	9			1		3	1	2	2							
31-38	6	1		1		2	1	1								
23-30	0															
15-22	4		1	1		1			1							
	f	3	1	6	3	15	10	5	10	7	5	7	1	1	2	

Rxy .492 Mx 61.4 My 71.4

S.E. .0875 S.D. 6.0 S.D. 21.7

N 76

TABLE 32

THE CHEMISTRY APTITUDE TEST vs. THE MATHEMATICS TEST

Chemistry	f	49-50	51-52	53-54	55-56	57-58	59-60	61-62	63-64	65-66	67-68	69-70	71-72	73-74	75-76	77-78	f
111-118	1														1		
103-110	1										1						
95-102	3				1		1				1						
87-94	5						1		2	2							
79-86	11				1	1	3	2	1	1		2					
71-78	5	1		1	1	1			1								
63-70	5			1		2		1	1								
55-62	13		2		1	1	4	2		2						1	
47-54	13	1	1	1	4	4		2									
39-46	9	2		1	3	2	1										
31-38	6	3	1	1		1											
23-30	0																
15-22	4	1	1	1		1											
	f	8	5	6	11	13	10	7	5	5	2	2	0	0	1	1	f
														Mathematics			

Rxy .603 Mx 58.3 My 71.4

S.E. .0734 S.D. 5.9 S.D. 21.7

N 76

TABLE 33

THE ENGLISH TEST vs. THE SOCIAL STUDIES TEST

English	f	37-38	39-40	41-42	43-44	45-46	47-48	49-50	51-52	53-54	55-56	57-58	59-60	61-62
75-78	1													1
71-74	1								1					
67-70	2							2						
63-66	4								2	1	1			
59-62	8						1	3	1		2	1		
55-58	12			1		2	5	2	2					
51-54	5					1	3		1					
47-50	19			3	4	7	3	1			1			
43-46	7			1	3	3								
39-42	6	1		2	1	2								
35-38	9		4	2	1	1	1							
31-34	1		1											
27-30	1		1											
	f	1	6	9	9	16	13	8	7	1	4	1	0	1

Social Studies

Rxy .783 Mx 56.5 My 50.4

S.E. .0447 S.D. 9.4 S.D. 9.8

N 76

TABLE 34

THE ENGLISH TEST vs. THE NATURAL SCIENCES TEST

English	f	49-50	51-52	53-54	55-56	57-58	59-60	61-62	63-64	65-66	67-68	69-70	71-72	73-74	75-76
75-78	1														1
71-74	1											1			
67-70	2											1		1	
63-66	4								1			2			1
59-62	8						2		3	1	1	1			
55-58	12					1		1	2	4	3		1		
51-54	5					1	2				1	1			
47-50	19	1				7	4	1	3	2		1			
43-46	7	1				2	1	2	1						
39-42	6			1	1	2	1	1							
35-38	9	1		4	2	2									
31-34	1		1												
27-30	1			1											
	f	3	1	6	3	15	10	5	10	7	5	7	1	1	2
Natural Sciences															

Rxy .731 Mx 61.4 My 50.4

S.E. .0450 S.D. 6.0 S.D. 9.8

N 76

TABLE 35

THE ENGLISH TEST vs. THE MATHEMATICS TEST

English	f	49-50	51-52	53-54	55-56	57-58	59-60	61-62	63-64	65-66	67-68	69-70	71-72	73-74	75-76	77-78
75-78	1														1	
71-74	1											1				
67-70	2							1		1						
63-66	4					2	1				1					
59-62	8			1		3		1	1	1		1				
55-58	12			2		2	1	3	1	3						
51-54	5	1			1		2		1							
47-50	19	2		1	4	3	4	2	1		1				1	
43-46	7	1	1	1	2	1	1									
39-42	6				4	1	1									
35-38	9	2	4	1		1			1							
31-34	1	1														
27-30	1	1														
	f	8	5	6	11	13	10	7	5	5	2	2	0	0	1	1
														Mathematics		

Rxy .585 Mx 58.3 My 50.4

S.E. .0760 S.D. 5.9 S.D. 9.8

N 76

TABLE 36

THE SOCIAL STUDIES TEST vs. THE NATURAL SCIENCES TEST

Social Studies	f	49-50	51-52	53-54	55-56	57-58	59-60	61-62	63-64	65-66	67-68	69-70	71-72	73-74	75-76	Natural Sciences
85-88	1														1	
81-84	0															
77-80	0															
73-76	1										1					
69-72	4								1	1		1			1	
65-68	1								1							
61-64	7								2		1	4				
57-60	8					1	2			1	1	2		1		
53-56	13			1			2	1	4	3	2					
49-52	16			1		4	4	2	2	2			1			
45-48	9	2			1	3	1	2								
41-44	9					1	7	1								
37-40	6	1	1	3	1											
	1			1												
		3	1	6	3	15	10	5	10	7	6	7	1	1	2	f

Rxy .762 Mx 61.4 My 56.5

S.E. .0484 S.D. 6.0 S.D. 9.4

N 76

TABLE 37

THE SOCIAL STUDIES TEST vs. THE MATHEMATICS TEST

Social Studies	f	49-50	51-52	53-54	55-56	57-58	59-60	61-62	63-64	65-66	67-68	69-70	71-72	73-74	75-76	77-78	f
85-88	1														1		
81-84	0																
77-80	1					1											
73-76	4						1		1			1				1	
69-72	1					1											
65-68	7					1	2	1		1	1	1					
61-64	8			1	1	2		2		2							
57-60	13	1	1	1		3	1	2	2	1	1						
53-56	16		1	1	6	2	3	2		1							
49-52	9	3		1	1	2	2										
45-48	9	1	2	1	3	1			1								
41-44	6	3	1	1					1								
37-40	1						1										
		8	5	6	11	13	10	7	5	5	2	2	0	0	1	1	f
														Mathematics			

Rxy .605 Mx 58.3 My 56.5

S.E. .0732 S.D. 5.9 S.D. 9.4

N 76

TABLE 38

THE NATURAL SCIENCES TEST vs. THE MATHEMATICS TEST

Natural Sciences	f	49-50	51-52	53-54	55-56	57-58	59-60	61-62	63-64	65-66	67-68	69-70	71-72	73-74	75-76	77-78
75-76	2										1				1	
73-74	1									1						
71-72	1									1						
69-70	7								1	1	1	1	1	1		1
67-68	5							1	3	1						
65-66	7						1		1	2	2		1			
63-64	10					1		4		3		1		1		
61-62	5					1	1		2			1				
59-60	10		1		1	3	2	3								
57-58	15		2	2	2	5	2		1	1						
55-56	3		1		1	1										
53-54	6		2	2				1		1						
51-52	1		1													
49-50	3		1	1			1									
			8	5	6	11	13	10	7	5	5	2	2	0	0	1	1	f
			49-50	51-52	53-54	55-56	57-58	59-60	61-62	63-64	65-66	67-68	69-70	71-72	73-74	75-76	77-78	Mathematics

Rxy .669 Mx 58.3 My 61.4

S.E. .0637 S.D. 5.9 S.D. 6.0

N 76

WHERRY-DOOLITTLE WORK SHEET

THE WHERRY-DOOLITTLE MULTIPLE CORRELATION TABLE

Rxy (non-shrunken) = .577

	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Test 7	Test 8	-Crit. -C	Check Sum	Test Selected
a_1	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	Test 4
b_1	.492	.781	.762	1.000	.669				-.457	3.247	Natural
c_1	-.492	-.781	-.762	-1.000	-.669				.457	-3.247	Sciences
a_2	1.000	.416	.315	.492	.603				-.450	2.376	Test 1
b_2	.757936	.031748	-.059904	"	.273852				-.225156	.778476	Chemistry
c_2	-1.000	-.041887	.079036	"	-.361313				.297066	-1.027099	Aptitude
a_3	.315	.783	1.000	.762	.605				-.413	3.052	Test 3
b_3	"	.190387	.414621	"	.116866				-.082561	.639314	Social
c_3	"	-.459183	-1.000	"	-.281862				.199124	-1.541924	Studies
a_4	.603	.585	.605	.669	1.000				-.323	3.139	Test 5
b_4	"	-.002623	"	"	.420553				.087356	.505286	Mathematics
c_4	"	.006237	"	"	-1.000				-.207717	-1.201480	
a_5											
b_5											
c_5											
V_1	-.450	-.443	-.413	-.457	-.323				-1.000	-3.086	
V_2	-.225156	-.086083	-.064766	"	-.017267				-1.208849	-1.602121	
V_3	"	-.076652	-.082561	"	.064085				-1.275735	-1.370863	
V_4	"	-.038741	"	"	.087356				-1.292175	-1.243560	
V_5	"	-.038196	"	"	"				-1.310320	-1.348516	
Z_1	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	6.0000	
Z_2	.757936	.390039	.419356	"	.552439				.791151	2.910921	
Z_3	"	.388709	.414621	"	.453493				.724265	1.981088	
Z_4	"	.301287	"	"	.420553				.707825	1.429665	
Z_5	"	.301271	"	"	"				.689680	.990951	

M	$\frac{V^2_m}{Z_m}$	$\left(1-\sum\frac{V^2_m}{Z_m}\right) = K^2$	$\left(\frac{N-1}{N-M}\right)$	$K^2\left(\frac{N-1}{N-M}\right) = \overline{K}^2$	$(1-\overline{K}^2) = \overline{R}^2$	$\overline{R}$	Test Selected
0	- - - - -	1.000000	(N =)	- - - -	- - - - -	- - - -	- - - -
1	.208849	.791151	1.000000	.791151	.208849	.457	Test 4 NS
2	.066886	.724265	1.0135135	.734053	.265947	.516	Test 1 CA
3	.016439	.707826	1.027397	.727281	.272782	.522	Test 3 SS
4	.018145	.689681	1.041667	.718418	.281582	.531	Test 5 Ma
5	.004843	.684838	1.056338	.723420	.276580	.526 *	Test 2 Eng*

* Test 2, English, should not be included in the test battery because the shrunken multiple correlation is reduced when Test 2 is added.

TABLE 40

PREDICTION OF MOST PROBABLE G.P.R. IN THE COLLEGE OF PHARMACY

	Chemistry		Social Studies		Natural Sciences		Mathematics	
	Scaled	Weight	Scaled	Weight	Scaled	Weight	Scaled	Weight
16	.25	67 1.06	37	.89	49	1.48	49	-3.09
17	.27	68 1.08	38	.92	50	1.52	50	-3.12
18	.29	69 1.09	39	.94	51	1.55	51	-3.15
19	.30	70 1.11	40	.96	52	1.58	52	-3.18
20	.32	*71 1.12	41	.99	53	1.61	53	-3.21
21	.33	72 1.14	42	1.01	54	1.64	54	-3.24
22	.35	73 1.16	43	1.04	55	1.67	55	-3.27
23	.36	74 1.17	44	1.06	56	1.70	56	-3.30
24	.38	75 1.19	45	1.09	57	1.73	57	-3.33
25	.40	76 1.20	46	1.11	58	1.76	*58	-3.37
26	.41	77 1.22	47	1.13	59	1.79	59	-3.40
27	.43	78 1.24	48	1.16	60	1.82	60	-3.43
28	.44	79 1.25	49	1.18	*61	1.85	61	-3.46
29	.46	80 1.27	50	1.21	62	1.88	62	-3.49
30	.48	81 1.28	51	1.23	63	1.91	63	-3.52
31	.49	82 1.30	52	1.25	64	1.94	64	-3.55
32	.50	83 1.32	53	1.28	65	1.97	65	-3.58
33	.52	84 1.33	54	1.30	66	2.00	66	-3.61
34	.54	85 1.35	55	1.33	67	2.03	67	-3.64
35	.55	86 1.36	56	1.35	68	2.06	68	-3.67
36	.57	87 1.38	*57	1.37	69	2.09	69	-3.70
37	.59	88 1.39	58	1.40	70	2.12	70	-3.74
38	.60	89 1.41	59	1.42	71	2.15	71	-3.77
39	.62	90 1.43	60	1.45	72	2.18	72	-3.80
40	.63	91 1.44	61	1.47	73	2.21	73	-3.83
41	.65	92 1.46	62	1.50	74	2.24	74	-3.85
42	.67	93 1.47	63	1.52	75	2.27	75	-3.89
43	.68	94 1.49	64	1.54	76	2.30	76	-3.92
44	.70	95 1.51	65	1.57			77	-3.95
45	.71	96 1.52	66	1.59				
46	.73	97 1.54	67	1.62				
47	.74	98 1.55	68	1.64				
48	.76	99 1.57	69	1.66				
49	.78	100 1.58	70	1.69				
50	.79	101 1.60	71	1.71				
51	.81	102 1.62	72	1.74				
52	.82	103 1.63	73	1.76				
53	.84	104 1.65	74	1.78				
54	.85	105 1.66	75	1.81				
55	.87	106 1.68	76	1.83				
56	.89	107 1.70	77	1.86				
57	.90	108 1.71	78	1.88				
58	.92	109 1.73	79	1.91				
59	.93	110 1.74	80	1.93				
60	.95	111 1.76	81	1.95				
61	.97	112 1.77	82	1.98				
62	.98	113 1.79	83	2.00				
63	1.00	114 1.81	84	2.03				
64	1.01	115 1.82	85	2.05				
65	1.03	116 1.84						
66	1.05	117 1.85						

* Mean Score

Multiple $\bar{R}$ (shrunken)	.531
Multiple R (non-shrunken)	.577
Chemistry Weight	.015844
Natural Sciences Weight	.030303
Social Studies Weight	.024115
Mathematics Weight	- .030893
Constant (K)	-1.57330

SAMPLE:

Test	Scaled	Weight
Chemistry	71	1.12
Social Studies	57	1.37
Natural Sciences	61	1.85
Mathematics (-K)	58	-3.37
Most Probable G.P.R.		.97
S.E. of Estimate		.774